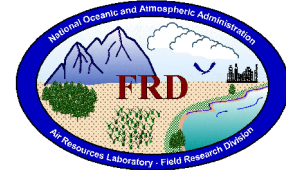


FRD Activities Report July 2004



Research Programs

Smart Balloon Launches During NEAQS - ITCT

During the month of July, two smart balloons equipped with ozone analyzers were launched in Lagrangian experiments as a part of the New England Air Quality Study - Intercontinental Transport and Chemical Transformation (NEAQS-ITCT). The low-power ozone analyzers were developed over the past year at the University of New Hampshire (Robert Talbot and Don Troop) and we then integrated them into our smart balloon instrument package. The smart balloons were used not only to track and measure ozone in the plume of pollution moving over the northeastern tip of Long Island, but also were used as a marker for the NOAA P-3 aircraft to return to the same plume for additional air quality sampling repeatedly over extended periods of time.

On July 15th, Balloon #1 was launched from the Orient, New York, fire station and tracked for 21 hours. The flight was terminated near Kingman, Maine. The balloon was recovered in the very dense forest of northeastern Maine, nearly two days after it was launched. Recovery of Balloon #1 would eventually allow us to launch a fourth balloon later in the experiment (See August Report). Position, altitude and ozone data were recorded and stored every ten seconds over the full period of time. Altitude control worked very well except for a short period of time north of Boston when the balloon encountered a rain storm. The sudden afternoon rain caused the balloon to descend from around 600 meters ASL level to below 100 meters ASL.

On July 20th, Balloon #2 was launched from the Orient fire station and tracked for 49 hours. The balloon flight was terminated five miles north of Prince Edward Island, Canada, when a rapid decrease in helium pressure was detected. A possible cause for the sudden decrease in helium pressure could have been a substantial leak in the cut down valve at the top of the balloon. The NOAA P-3 aircraft was able to return three times to the air parcel marked by Balloon #2 over its 49-hour flight. (Randy Johnson, 208 526-2129, and Shane Beard)

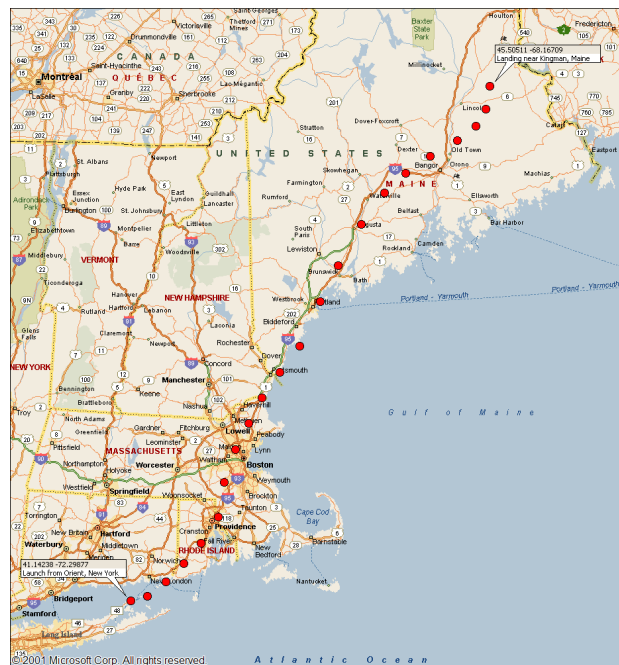


Figure 1. Smart balloon #1 launched from Orient, NY and recovered near Kingman, ME after a 21-hour flight. Red dots show the path of the balloon at 1 hour intervals.

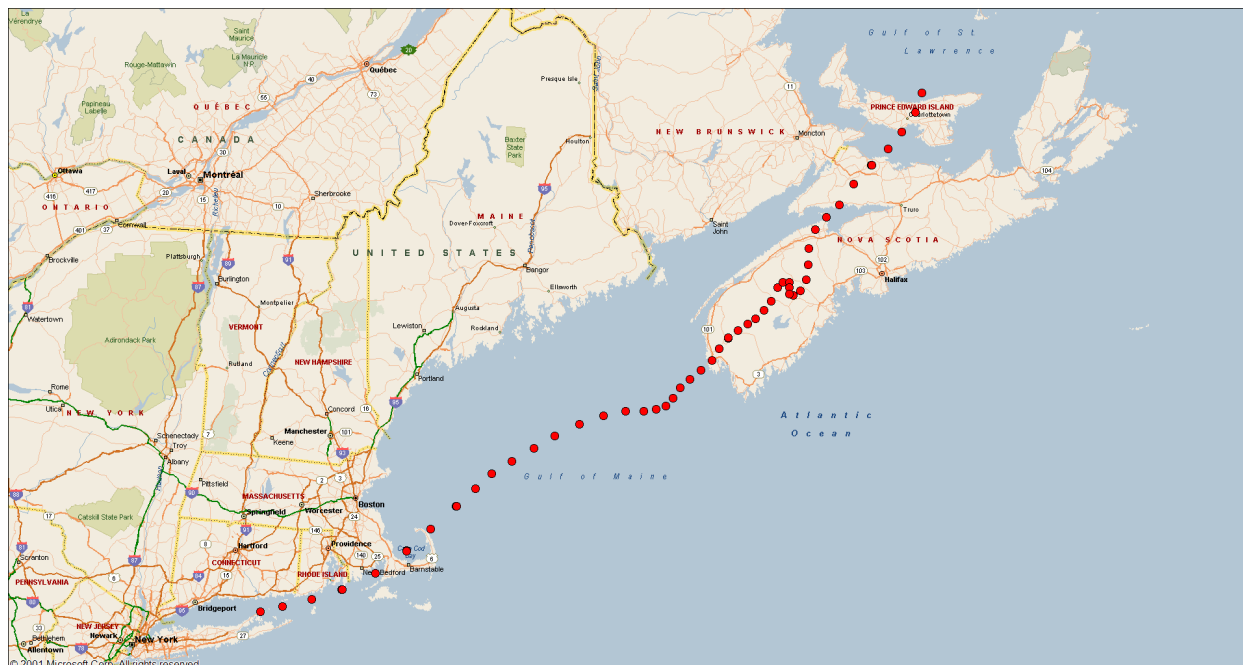


Figure 2. Balloon #2 launched from Orient, NY on July 20, 2004 and terminated 5 miles north of Prince Edward Island, Canada. Red dots show the path of the balloon at one hour intervals.

Pentagon Shield

The data from the Programmable Integrating Gas Samplers (PIGS) is undergoing a thorough quality control review. We have completed a comparison of field records and analysis records to ensure that the correct data is associated with each field location. A time history plot of each sampler was created and reviewed for consistency within the 12-bag sample set and with nearby samples. Any apparent problems were investigated carefully and the data appropriately flagged if there were indications that it was unreliable. The data have also been compared with the list of locations used in each Intensive Observation Period (IOP) to make sure that data is available for each location. A description of the locations is being generated to be delivered with the data set.

Initial analysis, calibration and peak extraction from the continuous analyzer data has been completed. The results of this process have been verified by a second analyst. An algorithm to extract the data and estimate the baseline from the ultra pure air ran as calibration gas has been implemented and appears to provide reasonable results. Generation of output files that are correctly adjusted for baseline drift and that contain QC flags is currently in process. These files will need to be reviewed and any errors corrected before they may be released. Correct location information will also be included. (Roger Carter, 208 526-2745, and Debbie LaCroix)

CBLAST-High

Final preparations were completed for the upcoming hurricane season. Data were processed from last month's NOAA P-3 test flights in Tampa. The data confirm that each of the BAT instruments operated properly. The P-3 aircraft was unavailable for hurricane research flight in July because of its participation in the NAME project. The P-3 is due to return to MacDill Air

Force Base in early August and is scheduled to be available for CBLAST tasking by August 18. The CBLAST Hurricane project will be transferred to NOAA Atmospheric Turbulence and Diffusion Division in Oak Ridge effective August 8. Further developments in the CBLAST-Hurricane project will be reported by ATDD. (Jeff French, 208-526-0566)

CBLAST-Low Winds

Work continues on a manuscript entitled “Spatial Variability of C_D as Measured From an Aircraft in Light Winds.” A first draft is nearly completed and we expect to submit the manuscript for ARL review in August. The paper focuses on data collected during the 2001 CBLAST-Low Winds pilot study in Martha’s Vineyard. It specifically looks at observed low C_D values and the spatial variability of C_D and other variables. (Jeff French, 208-526-0566, Tami Grimmett)

ET Sphere

FRD has completed much of the testing of the modified “big port” ET sphere, and is now focusing mostly on preparations for deployment. This system has performed reliably in pre-deployment tests, and appears to handle rain without serious problems. ATDD is still working on an alternative sphere design that uses a pump to backflush the pressure ports. There were no conclusive results reported on this alternative system as of the end of July. Currently, the plan is to deploy three ET spheres. Two of these will definitely be the big-port design. The third will be the backflushed sphere if testing shows that it works properly. (Richard Eckman, 208 526-2740, and Tom Strong, FRD; Ron Dobosy and Dave Senn, ATDD)

Proteus Aircraft

Work on the fabrication of a BAT probe for the Proteus aircraft was completed in July. Final bench testing and calibration were also completed. Installation and integration of the system were originally due to begin in July/August but has been postponed until fall after the aircraft returns from a deployment in Alaska. (Jeff French, 208-526-0566)

Cooperative Research with INEEL

Semi-Annual Preventative Maintenance and Calibration

The semi-annual preventative maintenance and calibration of all meteorological sensors in the INEEL Mesonet that was started in June was completed during the month. During the inspection, all of the meteorological instrumentation on the 35 towers were examined to verify proper operation and calibration. Necessary repairs or replacements were made to ensure continued operation. All instruments were calibrated to NIST-traceable standards to verify that the data being collected is accurate and complete. (Tom Strong, 209 526-5434)

Emergency Operations Center (EOC)

The EOC was activated on July 26 when a small amount of anhydrous hydrofluoric gas leaked from an overpack canister at the INTEC facility. Old cylinders are being recovered from an existing burial pit and the work area is monitored on a continual basis to detect any leakage. The INTEC facility was evacuated while the faulty valve was plugged. Kirk Clawson provided meteorological support and MDIFF model runs.

INEEL Support

FRD has been operating a surface-flux tower at INEEL for several years, but some of the equipment has started to deteriorate. In particular, sensors associated with computing the soil heat flux appear to have malfunctioned. New sensors have been purchased, including some spares that will allow rapid replacement of malfunctioning sensors in the future. FRD is also planning to purchase some Li-Cor 7500 open-path H₂O and CO₂ analyzers as replacements for the aging Infrared Gas Analyzer (IRGA) currently in use with the flux tower. This tower is expected to see increased use at the INEEL for estimating atmospheric stability, mixing depth, and turbulence levels. At some point, a second flux system may be installed at the northern end of INEEL, since the dispersion meteorology there is often substantially different from the southern end. (Richard Eckman, 208 526-2740, Tom Strong, Kirk Clawson)

INEEL Mesoscale Modeling

The malfunction of FRD's main web server disrupted the public interface to the FRD MM5 forecasts. This hiatus was used to perform several upgrades to the model. It is now clear that the soil volumetric water content provided by the NCEP Eta model is almost always too high for Southeast Idaho. This leads to unrealistic surface energy budgets in MM5, particularly for the sagebrush-steppe ecosystem around the INEEL. The MM5 configuration has been changed to use the Pleim-Xiu land surface scheme, because it allows one to specify more realistic soil water contents for each land-use category. It also allows the soil water to be nudged based on surface temperature and humidity observations. The new configuration provides much more realistic surface energy budgets, and it also appears to do a better job of forecasting peak afternoon wind speeds.

The Alpha workstation originally used for running MM5 suffered yet another hardware malfunction, and there are currently no plans to reactivate it. All the focus is now on the Linux-based MM5 system that uses the 12 km Eta output for initialization (except for soil water). This configuration has two grids with 12 and 4 km spacings. A 1.33 km grid has also been set up, but it is not normally active. (Richard Eckman, 208 522-2740)

Other Activities

Personnel

Jeffrey French, who has been with FRD since July 1999, left at the end of this month. Jeff

worked with the late Dr. Tim Crawford in FRD's geosciences research program. Most recently, Jeff has worked on turbulence measurements in hurricanes with the NOAA P-3. Jeff transferred to the ARL Lab (ATDD) in Oak Ridge, TN, where he will assume his new duties on August 9. He will be missed at FRD, but we wish him well in his new position.

Travel

Randy Johnson and Shane Beard to Greenport, NY, June 30 through August 6 for the NEAQS - ITCT smart balloon project.